REMARKS

Claims 1-11 are pending in this application. By this Amendment, claim 1 is amended and new claims 9-11 are added. Support for the amendments to claim 1 can be found in the specification as originally filed, for example, at paragraphs [0042] and [0046], and in claim 1 as originally filed. Support for new claims 9-11 can be found in the specification as originally filed, for example, at paragraphs [0046] and [0067]. No new matter is added by these amendments.

The courtesies extended to Applicant's representative by Examiner Bernatz at the interview held March 15, 2005, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

I. Claim Rejection Under 35 U.S.C. §102

The Office Action rejects claim 1 under 35 U.S.C. §102(e) over U.S. Patent No. 6,819,532 B2 to Kamijo. Applicants respectfully traverse this rejection.

This rejection is improper at least because Applicant's claimed priority date precedes the filing date of Kamijo. Kamijo has an actual filing date in the United States of September 26, 2002, and was patented on November 16, 2004. The instant application, however, was filed in the United States on August 5, 2003, and claims priority based on a Japanese patent application, JP 2002-263199, filed September 9, 2002. A certified copy of the Japanese patent application was submitted to the U.S. Patent and Trademark Office on August 5, 2003. An accurate English-language translation of the priority application is filed herewith. As the instant claims are fully supported by the priority document, Kamijo is not prior art to the instant application, and the rejection must be withdrawn.

II. Claim Rejections Under 35 U.S.C. §103

The Office Action rejects claims 1-8 under 35 U.S.C. §103(a) over U.S. Patent Application Publication No. 2002/0051380 A1 to Kamiguchi in view of U.S. Patent No. 6,287,709 B1 to Mizuguchi.

Independent claim 1 sets forth an "exchange-coupled film in which an antiferromagnetic layer and a ferromagnetic layer sandwich are stacked and in which a direction of magnetization of the ferromagnetic layer sandwich is pinned, wherein said ferromagnetic layer sandwich comprises a first ferromagnetic layer containing a ferromagnetic material of the body-centered cubic structure, and a pair of second ferromagnetic layers containing a ferromagnetic material of the face-centered cubic structure and formed on respective sides of the first ferromagnetic layer, and wherein said antiferromagnetic layer contains a disordered alloy chosen from the group consisting of IrMn alloys, RuRhMn alloys, FeMn alloys and RuMn alloys, and said antiferromagnetic layer is kept in contact with one of said second ferromagnetic layers, and wherein said antiferromagnetic layer has a thickness of 10 nm or less." Claims 2-8 depend either directly or indirectly from claim 1.

The Office Action cites Kamiguchi as disclosing an exchange-coupling film in which an antiferromagnetic layer and a ferromagnetic layer are stacked, a direction of magnetization of the ferromagnetic layer sandwich is pinned, wherein the ferromagnetic layer sandwich includes a first ferromagnetic layer containing a ferromagnetic material of the body-centered cubic structure, and a pair of second ferromagnetic layers containing a ferromagnetic material of the face-centered cubic structure and formed on respective sides of the first ferromagnetic layer, and the antiferromagnetic layer is kept in contact with one of the second ferromagnetic layers. While the Office Action admits that Kamiguchi does not disclose an antiferro-magnetic layer comprising a disordered alloy, it relies on Mizuguchi as teaching that ordered

and disordered antiferromagnetic layers are equivalents in the field of pinning layers. Applicants respectfully disagree.

Kamiguchi discloses combining a face-centered cubic structure ferromagnetic layer and a body-centered cubic structure ferromagnetic layer in a pinned layer. *See* Kamiguchi , paragraphs [0104]-[0106], [0150]-[0151]. By combining face-centered cubic structure ferromagnetic layers with body-centered cubic structure ferromagnetic layers, a considerable screen effect with regard to conduction electrons can be obtained, and high resistance and high rate of change in the magnetoresistance effect can also be obtained. *See* Kamiguchi, paragraph [0105]. However, Kamiguchi does not provide any teachings relating to contacting a face-centered cubic structured ferromagnetic layer specifically with the antiferromagnetic layer to increase the exchange-coupling energy. *See generally* Kamiguchi.

Further, Kamiguchi does not disclose or suggest that smaller thicknesses of the antiferromagnetic layer may be used while still obtaining sufficient exchange-coupling energy. *See generally* Kamiguchi. Rather, Kamiguchi teaches, in its examples and comparative examples, only antiferromagnetic layers having thicknesses of 15 nm. *See* Kamiguchi, paragraphs [0163], [0171], [0175], [0178], [0183], [0191], [0199], [0206]. Nowhere does Kamiguchi disclose or suggest that sufficient exchange-coupling energy could be obtained using antiferromagnetic layers having smaller thicknesses, such as 10 nm or less, as set forth in claim 1. *See generally*, Kamiguchi.

Mizuguchi discloses an antiferromagnetic layer that may be an ordered alloy or a disordered alloy. *See* Mizuguchi, col. 4, lines 26-34. However, Mizuguchi nowhere discloses or suggests any effects relating to contacting a disordered alloy antiferromagnetic layer with a face-centered cubic structure ferromagnetic layer. *See generally*, Mizuguchi. In particular, Mizuguchi does not disclose or suggest that exchange-coupling energy could be affected by

using antiferromagnetic layers having small thicknesses, such as 10 nm or less, as set forth in claim 1. *See generally*, Mizuguchi.

Thus, the combined disclosures of Kamiguchi and Mizuguchi teach that considerable screen effect with regard to conduction electrons, high resistance and high rate of change in the magnetoresistance effect can be obtained by combining a face-centered cubic structure ferromagnetic layer and a body-centered cubic structure ferromagnetic layer in a pinned layer and including an antiferromagnetic layer that can be either an ordered or disordered alloy. But, neither cited reference discloses or suggests contacting a face-centered cubic structured ferromagnetic layer specifically with the antiferromagnetic layer to increase the exchange-coupling energy. *See generally* Kamiguchi; Mizuguchi.

As agreed during the March 15 personal interview, the exchange-coupled film set forth in claim 1, in which a face-centered cubic structured ferromagnetic layer is kept in contact with an antiferromagnetic layer of a disordered alloy, provides unexpected results that cannot be derived from the combined Kamiguchi and Mizuguchi references. In particular, the exchange-coupled film of claim 1 can obtain a high sufficient exchange-coupling yield, even with small thicknesses, such as 10 nm or less, of the antiferromagnetic layer comprising a disordered alloy. *See* Specification, paragraphs [0046], [0048]-[0062]; Fig. 2.

As can be seen from the Examples and Comparative Examples, the exchange-coupling energy of films in which a face-centered cubic structure ferromagnetic layer is contacted with a disordered alloy antiferromagnetic layer is much higher (e.g., Example 1, 341 Jk) than that of films in which a face-centered cubic structure ferromagnetic layer is contacted with an ordered alloy antiferromagnetic layer of the same thickness (e.g., Comparative Example 8, 105 Jk). *See* Specification, Fig. 2, Example 1, Comparative Example 8. In fact, comparable exchange-coupling energies can only be obtained for films

having ordered alloy antiferromagnetic layers when the antiferromagnetic layer thickness is increased to 13 nm or more.

Kamiguchi and Mizuguchi, individually and in combination, do not teach or suggest exchange-coupled films in which a face-centered cubic structured ferromagnetic layer is kept in contact with an antiferromagnetic layer of a disordered alloy, and a sufficient exchange-coupling yield is obtained, even with thicknesses of 10 nm or less of the antiferromagnetic layer comprising a disordered alloy.

For at least the reasons set forth above, Applicants respectfully submit that claim 1 and its dependent claims 2-8 are patentable over Kamiguchi and Mizuguchi. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

III. New Claims

By this Amendment, new claims 9-11 are added. These claims depend from and incorporate all of the limitations of independent claim 1, which is patentable for at least the reasons set forth above. Applicants respectfully submit that new claims 9-11 are patentable over the art of record for at least the same reasons that independent claim 1 is patentable.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-11 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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JAO:JMS/jms

Attachment:
English-language translation of JP 2002-263199

Date: May 3, 2005

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